Financing Transit Systems Through Value Capture

An Annotated Bibliography

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ABSTRACT. Much of the literature on value capture reports empirical findings on the incidence of rising land values related to distance from a transit stop following the installation of rail transit improvements. This annotated bibliography shows that the elevated value effects of transit access are well documented. The authors maintain that it is now time for transit/land-use research to move from hypothesis *testing to practical applications of value capture*. Longitudinal models can help predict land-value increments over a period of time, yielding estimates of the total capturable revenues that would support the debt financing of transit improvement projects.

Most mass transit systems are financed not by riders but largely by subsidies from local public general funds. Those subsidies necessitate either higher taxes, reduced spending on other public services, or both. Does mass transit need to be so highly subsidized? An underutilized source of funding involves the recovery of site value gains associated with properties near to transit stations. Were transit systems

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to use the economic value that they themselves generate, transit agencies would not have to rely so heavily on public subsidies. Is it possible to finance a mass transit system through a combination of fare box revenues and the capture of land-value increments within transit corridors? Nobel laureate economist William Vickrey claims that mass transit operators could keep fares at a minimum, even at zero during off-peak hours, by funding the bulk of operating costs as well as development costs from site rents (see Reference 13).

Transit riders, by not paying the full operating cost, are not the only free riders. Another group consists of the landowners who are in a position to capture windfall profits by virtue of owning land near newly installed rail transit stations. When a transit station opens, the owners' land values rise, so presently they are in a position to sell their advantageous locations at a higher price. Were owners to relinquish these unearned value increments, they would incur no loss on their original capital investment. But retaining this speculative gain is actually receiving a publicly created benefit. Unearned value increments are a public windfall that neither they nor any individual alone produced. Hence, the public sector is justified in recapturing at least some of this "betterment"—the value of the services rendered by installing the transit improvements. Earlier in our Western culture, this form of economic justice was more clearly understood; indeed, the words *own* and *owe* were once one word at a time when owners owed rent to their lord or king. Today, we frequently see the justice of government's compensation of owners for a property "taking"; we are now beginning to relearn the justice of compensating society for a "giving."

Value capture is the appropriation of land-value gains resulting from the installation of special public improvements in a limited benefit area. It is a betterment levy, based on ad valorem assessments of ordinary property taxes, and is similar in conception to development exactions and impact fees. The aim is to finance all or part of the costs of local transportation projects. Based on the "benefits received" rationale for public taxation, it proposes to recapture what is essentially publicly created value. Unlike building value, which derives from private capital investments, land value represents the speculative dimension of real estate. Thus, value capture is a variation of an

unearned increment tax, and is based on the premise that property owners benefiting from a government-conferred locational advantage should pay some portion of the cost of public improvements from which the added value is originally derived.

Having stated the claim of fiscal surety and the principle of recovering land-value increments, is value capture practicable in real-world settings? R. T. Meakin notes that Hong Kong's rail transit system receives no subsidy (see Reference 72). All costs, including interest on bond indebtedness, are paid from land rents derived from development in station areas. W. Rybeck estimated the added land values sequential to the development of Washington, D.C.'s Metro, and found a surplus of incremental land value (see Reference 23). D. Riley, who studied the London tube extension, also found that surplus land values were generated (see Reference 22).

To date, the bulk of the published studies related to the subject of value capture focus on the impacts of transit facilities on property values, with data obtained from properties within transit corridors. N. Tideman and R. J. Borhart both maintain that this limited perspective underestimates the full impact (see References 24 and 33). Potentially, a greater revenue base would be available to transit agencies if rising land values within an entire metropolitan region were appropriated through a general land-based property tax. The land tax also engenders cost-reducing incentives. Land acquisition comprises a substantial portion of the capital costs associated with constructing public transit facilities. This cost could be effectively reduced if ground rents were collected. That is, when the public sector captures incremental land values through the general property tax or through special levies on land within transit corridors, less value remains for private owners to capitalize into purchase price paid by successive buyers.

Localities could adopt additional forms of "green" taxation such as congestion pricing and vehicle emission permit fees to help fund transit systems. Other possible revenue sources include joint development agreements and the leasing of publicly owned sites near stations.

In the past, real estate developers built transit systems as an associated amenity, and recouped the capital costs from the sales of developed sites (still a common practice in Japan). Such profits from land

residuals are commonplace in the private sector, but could reasonably be extended to the public domain—where local government covers the financial risks and the costs of building transit systems. Robert Cervero holds that a central element of joint development amounts to a quid pro quo, whereby private developers' benefits from transit accessibility are capitalized into higher rents and occupancy rates, and transit agencies' capital funding is enhanced through cost-sharing mechanisms (see Reference 35).

Most studies of value-capture financing for transit focus on U.S. cities, where low-density development and auto dependency prevail. Studies have begun to emerge from developing countries where denser cities and a more even modal split can be found. Mobility is vital to a nation's prospects for development. As Lewis and Williams point out, affordable transit availability offers cash savings to householders (see Reference 71). One of the best examples of mass transit is found in Curitiba, Brazil. Colombia and Uruguay have built roads using value capture; Mexicali has replaced its conventional property tax with a land tax. Some of the authors cited in the fourth section of this bibliography ("Lessons from Developing Countries") note that while progressive legislation may be on the books, the practical means of capturing site values for transit projects is hampered by inadequate land registration records and lagging assessments.

This bibliography does not contain most of these older studies of transit-induced site values. In 1994, Huang compiled a bibliography on value-capture financing. The RICS Policy Unit recently compiled a review of literature on public transport and land values. Diaz, Lewis and Williams, Pickett and Perrett, the Transportation Research Board, and the U.S. Subcommittee on the City prepared earlier compilations. Some of the studies in this our bibliography do cite updates of older studies. If any of these or the more recent studies that we site here have influenced policymakers to employ value-capture financing methods, we are not aware of them.

Included in this bibliography are 76 annotated titles under the following topical headings:

- Financing public transportation
- Prospects for cost recovery

- Effects of transit facilities on property values
- Lessons from developing countries

I

Financing Public Transportation

1) Buchanan, M. *Urban Transport and Market Forces in Britain*, Anglo-German Foundation for Study Industrial Society, London, 1988, pp. 211–219. Available from: AGFSIS, 17 Bloomsbury Square, London, England.

The report features sections on buses, trains, and roads. The application of market forces and competition may decrease the public cost of transport and decrease traffic congestion in the United Kingdom. Thus far, policies addressing market forces have been confined largely to bus service, where deregulation has produced little change in service levels. Although public savings have been realized in large urban areas, the tendering process has led to major increases in county council costs and public transport staff. Market forces have not been effectuated in the railway system in the same way; large subsidies are still required. Tighter financial targets, the disposal of surplus land, and the subcontracting of work have all been undertaken, as have improvements in administration. Construction of new railways is being funded in part by the consequent increase in land values, an example being the London Docklands Railway. Four methods are discussed: allocating the subsidy to specific purposes; paying the subsidy via a third party; separating the operation of railways from the provision and maintenance of infrastructure; and privatization. Methods to commercialize road infrastructure include urban parking management, the financing of new highway construction from tolls, and road pricing. (From Transport and Road Research Laboratory in TRIS Database under "Taxing Property Values for Transit.")

2) California Tax Data. *California Codes, Public Utilities Code, Sections 33000–33020*, 100 Pacifica #470, Irvine, CA 92618. With reference to the *Draft 2004 Countywide Transportation Plan*, Los Angeles County.

The California Public Utilities Code authorizes the creation of

Special Benefit Districts in the vicinity of rail rapid transit stations. In 1985, the Southern California Rapid Transit District formed two benefit districts to help fund construction costs of the Segment I of the Metro Red Line. The funding plan included $130 million in revenues from the two districts to cover 9 percent of the capital costs of transit infrastructure and neighborhood amenities. The law requires nexus and proportionality between the assessments and locational benefits received. Districts contain zones based on distance from the station up to a half-mile radius in areas outside of the Los Angeles central business district. Assessment fees are graded according to the proximity of each zone to the station.

3) Gihring, Thomas A. "Applying Value Capture in the Seattle Region." *Journal of Planning Practice & Research* 16(Winter 2001): 307–320.

The "geo-bond" financing mechanism features the capture of land rent as distinct from other assessment devices that include the value of building improvements. Using the Broadway station area of Sound Transit's proposed LINK light rail line, the author employs a model simulating the tax effects of (1) a land-value tax as an alternative to the conventional property tax, and (2) a land-value gains tax, within the half-mile radius transit benefit district. The land-value-taxation (LVT) produces the desired development incentive effects, as it shifts the burden off buildings in this "main street" retail setting. The gains tax targets the surplus land value: the difference between the annual assessed land-value increase and the amount of general property tax paid. Over a 12-year period, the gains tax would support a bond principal amount of about $24 million. Sound Transit estimates the construction of the station and street improvements (excluding right-of-way acquisition) at $80 million.

4) Hagman, Donald G., and Dean J. Misczynski, eds. *Windfalls for Wipeouts: Land Value Capture and Compensation.* Planners Press, American Planning Association, Chicago, IL, 1978 (funded by the U.S. Dept. of Housing and Urban Development).

Special Assessment Districts (SAD) by local governments, once used extensively, fell out of favor during the Great Depression. Yet by the 1970s, the tool was making a comeback. In 1913, Los Angeles,

Oakland, Portland, and Kansas City raised 20 percent of their budgets from SADs. When the Depression wiped out land value, civic bonds became difficult to pay off and lost their ratings. Then, by 1972, cities with populations over 100,000 that had SADs in effect (about 5 percent of all local jurisdictions) funded an aggregate 12 percent of their budgets through this method. With regard to the use of the land-value tax (LVT), the editors questioned the effectiveness of Pittsburgh's experience in shifting the property tax rate from buildings to locations, citing a 1973 Price Waterhouse study (written before the rate differential was increase to 6:1, land to improvements). Nevertheless, the solid results from using the LVT for developing Waikiki Beach, Hawaii were also noted.

5) Hayashi, Yoshitsugu. "Issues in Financing Urban Rail Transit Projects and Value Captures." ***Transportation Research. Part A: General*** **23A (January 1989): 35–44.**

In Japan, urban rail transit projects are suffering from cost burden due to the current financing system's dependence on borrowed money from loans and bonds that are repaid mainly by fares. The transit fund cannot bear increased expenditures from accelerated construction demand and the rising cost of land acquisition. This paper reexamines the financing system and analyzes the possible means of raising revenues. From the viewpoint of the benefits principle, the author examines the imbalance between those who bear the costs and those who receive the benefits, using Japanese examples.

6) Higginson, Martin. "Alternative Sources of Funding." ***Public Transport International*** **48 (September 1999).**

The author cites several transit systems. Copenhagen, Denmark, is funding a line to a new suburb by selling off public land in the Orestad business district, privatizing development, and collecting more property tax revenue from the rising land values. The rail project was scheduled to open in 2002.

7) Howard, Jane A. ***Strategies to Implement Benefit-Sharing for Fixed-Transit Facilities.*** **Series Report from Transportation Research Board, National Research Council, National Cooperative Transit Research & Development Program No. 12, 1984–1985.**

A Local Improvement District is a special property assessment to

pay for capital improvements benefiting a defined area. In Portland, Oregon, it is designed to collect some site rent (attributed increases in land values) for the purpose of funding transit-related improvements such as street paving, streetscape amenities, and trolley stanchions. As the result of a required vote, downtown owners unanimously approved the LID and are assessed by square footage of land (excluding buildings), with greater weight given to frontage within 100 feet of transitways. The LID is paying off $1.5 million in bonds over 20 years. That amounts to more than a quarter of the $5.5 million total project cost.

8) Ito, M. *Establishing New Measures to Construct New Railroad Lines.* JTERC Reports 11, Japan Transport Economics Research Centre, Tokyo, Japan, March 1989.

This study examines the New Joban Railway Line in the northeastern area of Tokyo. It estimates land values of properties along the corridor, with and without the rail line, and calculates the resulting increment. Methods of ensuring that a region receives an adequate return on its investment are discussed. Included are (1) local taxes for a Railroad Construction Fund; and (2) reduction of station construction costs, either by setting up a trust company to construct a combination of station retail outlets, or by making the developer or local companies responsible for some of the costs. For rural areas, the author recommends a system of integrated development, ensuring that development of residential, educational, and cultural facilities along the line keep pace with rail construction. Also included are suggested methods by which problems of acquiring railway land can be overcome. (See IRRD 857359 in Transport Research Laboratory on TRIS Database, "Taxing Property Values for Transit.")

9) Ridley, T. M., and J. Fawkner. *Benefit Sharing: The Funding of Urban Transport Through Contributions from External Beneficiaries*. Report from the 47th Congress, International Union of Public Transport, 19 avenue de líUruguay, B-1000 Brussels, Belgium, 1987.

"Specific improvement assessments" funded the first 35 kilometers of Milan, Italy's Metro. The special levy is assessed on properties within 500 meters of stations. This form of LID had raised 36 billion

lire, but following its initial success the levy was replaced by a real estate transfer tax that feeds into the local general fund.

10) Shinbein, Philip J., and Jeffrey L. Adler. "Land Use and Rail Transit." *Transportation Quarterly* 49(3) (1995): 83–92.

In a case study of Orange County, New York, a case is made for shifting transit subsidies from the present system of general taxes to land-value taxes. Shinbein and Adler argue that it is realistic to think of self-financing transit improvements from LVT. Joint development programs coupled with permissive zoning to encourage high-density "pocket communities" near transit stations increase land values that can be recaptured to pay for capital costs of rail infrastructure.

11) Strathman, James G., and Kenneth J. Duecker. "Regional Economic Impacts of Local Transit Financing Alternatives: Input-Output Results for Portland." *Transportation Research Record* 1116 (1987).

This study ranks several taxing methods for funding transit. The one found least likely to distort economic activity is the gasoline tax, followed closely by the property tax. The least desirable method of raising revenues is a higher onboard fare, followed by a payroll tax. Taxes on income, parking, and sales produce moderate distortion effects. An input-output model is used to estimate the change in sectoral output that would result from a transfer of resources to transit operations, using all seven financing alternatives. The range in total sectoral output change is substantial.

12) Transportation Research Board, Transportation-Technology Management, Inc. *Financing for Capital Investment: A Primer for the Transit Practitioner.* TCRP Report 89, Transit Cooperative Research Program, 2003.

This federally funded report includes a comprehensive explanation of capital sources and financing mechanisms for local transit projects. It makes no mention of value capture or the use of land-value increments as a revenue source.

13) Vickrey, William S. "The City as a Firm." In *The Economics of Public Services*. Eds. M. S. Feldstein and R. F. Inman (London: MacMillan, 1977), pp. 334–345.

The author offers a modern extension of the land rent theories of

Henry George, setting the problem of land-value taxation and financing of public services in a general equilibrium framework. "The aggregate of the land rents generated by the urban agglomeration produced by the existence of activities with economies of scale within the city will equal the subsidies required to enable these activities to sell their output at prices equal to their respective marginal costs."

14) Walther, E., L. A. Hoel, L. J. Pignataro, and A. K. Bladikas. *Value Capture Techniques in Transportation: Final Report, Phase One.* Report No. DOT-T-90-11, Office of the Secretary of Transportation, of the United States May 1990.

The authors provide an overview of the potential use of value-capture techniques. Included is a general set of criteria for state and local officials to evaluate the applicability of value capture to specific funding situations. A series of techniques in communities of various sizes is provided, along with a decision support methodology based on a set of 63 indicators to evaluate specific value-capture proposals. Techniques include: special assessment districts, donations, negotiated investments, public/private partnerships.

II

Prospects for Cost Recovery

15) Allen, W. Bruce. "Value Capture in Transit." *Journal of the Transportation Research Forum* 28(1) (1987): 50–57.

This case study in south metropolitan Philadelphia offers an interdependent set of models of modal choice, station choice, and travel savings using the economic law of market areas. These models (1) spatially separate auto users from transit users, (2) spatially separate the users of station A from the users of station B, and (3) spatially connect the locii of all points where the user saves an equal amount of money by using transit over auto. All of these models yield hyperbolas that bend around the stations on the line. The station choice model is tested using auto access data for all suburban stations of the Philadelphia-Lindenwold high-speed line for a morning rush hour (recording 13,000 observations), and assumes the station chosen most often from any given location is the preferred station. The savings model is tested by postulating that residential sales price is a func-

tion of the characteristics of the property, the neighborhood, distance from the CBD, and savings (using over 1,300 real estate transactions from 1980). Each dollar's worth of daily savings is found to add $443 to the value of the property. The benefit to nontransit census tracts (less congestion and shorter travel times) was not added in; if it were added, savings would be 30 percent higher. Without it, $4,581 could be captured per single-family home. Within the transit census tracts, this adds up to $279.5 million, or 117.9 percent of the construction cost of the Lindenwold Line, the right-of-way of which did not need to be purchased. Buying the land and constructing bridges would have raised the cost to $820 million, of which captured land rent could have paid one-third (unless all rent were captured, which would drop land's price to zero). In order for the costs to be borne by the beneficiaries, land value should be captured at the time it is created, that is, between the announcement of a new improvement and its actual opening.

16) Alterkawi, Mezyad. "Land Economic Impact of Fixed Guideway Rapid Transit Systems on Urban Development in Selected Metropolitan Areas: The Issue of the Price-Distance Gradients." Ph. D. dissertations, Texas A&M University, 1991. Stock No: 91-33904 University Microfilms International.

This study noted Toronto's experience with the Yonge Street Subway. Property tax revenues in the vicinity of the transit line increased an average of $5 million annually. This compares favorably with the $4 million annual cost of servicing the subway's capital financing bonds.

17) Anas, Alex. *The Effects of Transportation on the Tax Base and Development of Cities*. Report for the U.S. Dept. of Transportation, April 1983.

Transportation improvements and investments change zone-to-zone travel times and costs. This researcher's model forecasts changes in land values. The forecasts are determined annually and by small geographic zones in a metropolitan area. The Chicago application shows that under 1970 conditions, capitalized land-value changes are nearly 36–40 percent of the capital cost of rail rapid transit proposals then proposed for Chicago's southwest side. Similar calculations for bus systems appear more promising. Anas suggests a one-time

lump-sum property assessment rather than an increase in the land tax rate, since that latter would lower "site values." This would lower selling price, while the value remains the same (what buyers are willing to pay: price plus tax).

18) Batt, H. William. "Value Capture as a Policy Tool in Transportation Economics: An Exploration in Public Finance in the Tradition of Henry George." *American Journal of Economics and Sociology* 60(1) (2001): 195–228.

This study shows how value capture could have been used to finance a nine-mile portion of the New York State interstate highway system. The added increment of land value attributed to the Northway sector amounted to 11 times that of the cost of right-of-way acquisition and road and bridge construction. Batt concludes that the windfall gains in land value that fell to private landowners could easily have paid off the bonds issued to build the project. Furthermore, the added taxes from value-capture assessments in the highway corridor removes the invitation to landholders to speculate on their sites. Batt argues that pricing approaches to the recovery of costs of government services is more attractive than conventional "command and control" police power approaches.

19) Hack, Jonathan. *Regeneration and Spatial Development: A Review of Research and Current Practice*. IBI Group, Toronto, 2002.

This paper provides specific examples of how, and to what degree, urban transit investment (principally light rail) has stimulated urban regeneration and created private opportunities for private sector investment in transit corridors, notably around transit stations. The case studies provided are derived from a review of research to date that showcases recent examples of LRT investment in Europe and North America. See Appendix for a summary of observations.

20) Nakagawa, D., and R. Matsunaka. *Funding Transport Systems: A Comparison Among Developed Countries.* Pergamon, 1997.

The authors repeat the findings of Tsukada and Kuranami (see Reference 75) that in Japan private railroads manage real estate within rail corridors, and thereby enhance profits.

21) Nathanson, Phyllis J., and Gary Booher. *Survey of Joint Development and Value Capture Activity in Selected Metropolitan Areas.* City of Los Angeles Planning Department, 1983.

Among several systems noted in this survey, Miami's Metrorail raised sufficient site rent to cover 25 percent of its total capital cost ($116 million).

22) Riley, Don. *Taken for a Ride: Trains, Taxpayers, and the Treasury.* Centre for Land Policy Studies, 4 O'Meara Street, London SE1 1TE, 2001.

London's Jubilee Underground extension cost £3.5 billion, raising the nearby land's rental value by £1.3 billion. Public collection of 25 percent of that increase would pay off the Jubilee in 20 years. In the vicinity of Edinburgh, Scotland, developers are co-funding a new line on old right-of-way.

23) Rybeck, Walter. *Transit-Induced Land Values: Development and Revenue Implications*. Report published in *Commentary*, Council on Urban Economic Development, October 24, 1981, pp. 23–27.

In his report to Congress, this former staff member to Sen. Paul Douglas noted that Washington, D.C.'s Metro, after some $3 billion in expenditures by 1981, was 40 percent complete and had generated over $2 billion in additional land value. By January 2001, after $9.5 billion in capital expenditures, the completed system had generated between $10 and $15 billion in new land value.

24) Tideman, Nicolaus. "Integrating Rent and Demand Revelation in the Evaluation and Financing of Services." In *Does Economic Space Matter?* Eds. Hiroshi Ohta and Thisse Jacques-Francois (London: MacMillan, 1993), pp. 133–150.

Taking into account more than just the property selling price, this researcher considers how a transportation project changes the returns to land, labor, and capital, compared to the project's costs: (1) the increase in privately collected rent—in other words, the increase in the selling price (and lease value) of land; (2) the increase in taxes on land; (3) the decrease (more usual than an increase) in its value because capital can't be moved (as the land rose in value but buildings fell in value); (4) the change in taxes on existing buildings; (5) the taxes on new buildings erected in response to the transportation

improvements; (6) the cost of extra public services for the added buildings (unless there are user fees); (7) the extra tax revenue if there is a sales tax or a wage tax that reduces land values; (8) the savings in travel time if low fares reduce congestion; (9) reduced smog; and (10) the loss of human happiness from uncompensated personal adjustment to the change in the built environment. The sum of these 10 items is compared to the transportation system costs.

25) U.S. Congress, House Committee on Banking, Finance, and Urban Affairs, Subcommittee on the City. *New Urban Rail Transit: How Can Its Development and Growth-Shaping Potential Be Realized?* U.S. Government Printing Office, 1980.

From page 81: Burkhardt and Howard summarize historical evidence: "Major land value increases occurred in many station areas of New York City's expanding transit system in the early 1900s." From page 124: Donald Richmond states, "[t]he (Toronto Transit) Commission . . . experience . . . suggests that the long-term land-leasing program can completely recover land acquisition costs over a reasonable time period."

III

Effects of Transit Facilities on Property Values

26) Al-Mosaind, Musaad A., Kenneth J. Duecker, and James G. Strathman. "Light Rail Transit Stations and Property Values." *Transportation Research Record* 1400 (1993): 90–94.

Two forces are said to be at work in the relationship between proximity to light-rail transit stations and single-family home values. Proximity to LRT stations may improve the accessibility of residents to an urban area's central business district, and may also result in transportation cost savings. These effects are evidenced in higher property values. In metropolitan Portland, Oregon, two distance models to East Side MAX stations were compared. The first showed a positive capitalization in sale prices for homes within a quarter-mile walking distance. This effect was equally felt for all homes within that distance zone. The second model found that property values were estimated to decline with increasing distance to a station. However,

a clear price gradient was not evidenced. The authors conclude that nuisance effects produced by the station may play a role in reducing the potential benefits of close proximity to nearby homes. On average, the total contribution of proximity to stations adds nearly 10.6 percent to home prices.

27) Anas, A., and Regina Armstrong. *Land Values and Transit Access: Modeling the Relationship in the New York Metropolitan Area: An Implementation Handbook*. Report No. FTA-NY-06-0152-93, U.S. Federal Transit Administration, Office of Technical Assistance and Safety, Springfield, VA (National Technical Information Service), September 1993.

This article presents findings of a multiyear study of the relationship between land values and transit access in the New York area, as precursor to capturing this value for public transit. Initiated as an element of the Third Regional Plan for the New York/New Jersey/Connecticut region, the results serve as a research prototype for transit systems throughout the United States. Two economic models are presented that predict shifts in land values within the region and at a parcel scale in relation to transit stations. "The total benefits of reducing wait times on transit equal $3.7 billion ($1.57/trip). Taxing the producer surplus increases would raise $100 million/yr, enough to finance a doubling of the number of trains (an unknown cost)."

28) Armstrong Jr., Robert J. "Impacts of Commuter Rail Service as Reflected in Single-Family Residential Property Values." *Transportation Research Record* 1466 (1994): 88–97.

The effects of regional commuter rail service on single-family residential properties in metropolitan Boston, Massachusetts, are examined. The study area encompasses 1,920-square kilometers, with a total 1990 population of over 630,000, and uses records of 451 property sales. Controlling for structure and site attributes, as well as location and amenity variables, the regression model reveals a clear association between regional access to the Boston central business district provided by the rail service and appreciated property values. Residences located in communities having a rail station have a market value that is approximately 6.7 percent greater than residences in unserved communities.

29) Barker, William G. "Bus Service and Real Estate Values." ***68th Annual Meeting of the Institute of Transportation Engineers, Toronto, Ontario, 1998*** **(available from ITE, 1099 14th Street, NW, Washington, DC 20005-3438).**

Real estate developers and lending institutions are not willing to base investments on the location of easily changed bus routes. However, the availability of local bus service does increase the value of at least some urban real estate.

30) Benjamin, John D., and G. Stacy Sirmans. "Mass Transportation, Apartment Rent and Property Values." ***Journal of Real Estate Research*** **12(1) (1996): 1–8.**

This study examines the effects of transit access, measured in ground distance to the nearest Washington, D.C. Metrorail station, on residential rent levels. From over 250 observations of 81 apartment complexes, the authors find that rents decrease by 2.4 percent to 2.6 percent for each one-tenth mile in distance from a Metrorail station. Distance does not have a significant effect on occupancy rates. Rent levels play an important role in property values because any positive or negative influence on rent will in turn affect a property's market value.

31) Bernick, M., R. Cervero, and V. Menotti. ***Comparison of Rents at Transit-Based Housing Projects in Northern California*****. Working Paper 624, University of California at Berkeley, Institute of Urban and Regional Development, 1994.**

"Rents at the BART housing projects are higher than those of nearby projects."

32) Bollinger, C., K. Ihlanfeldt, and D. Bowes. "Spatial Variation in Office Rents Within the Atlanta Region." ***1996 TRED Conference, Lincoln Land Institute, Cambridge, Mass*****., Georgia State University, Policy Research Center, July 1998.**

This is a hedonic rent study of office buildings in the Atlanta area from 1990 to 1996. Part of the rent differences among office buildings is due to differences in wage rates, transportation rates, and proximity to concentrations of office workers. The convenience of face-to-face meetings facilitated by office agglomerations is also reflected in office rents, providing evidence that agglomeration tendencies continue to be important in explaining office concentrations,

despite the ability of information technology designed to reduce the need for some such contacts.

33) Borhart, Robert J. *Corridor Reservation: Implications for Recouping a Portion of the "Unearned Increment" Arising from Construction of Transportation Facilities.* Final Report, Virginia Transportation Research Council, Charlottesville, VA. Series title: VTRC; 94-R15, 1994.

Increases in land rents show up in higher property taxes, not only in property selling prices. The author quotes President Franklin D. Roosevelt supporting value capture.

34) Cambridge Systematics. *Economic Impact Analysis of Transit Investments: Guidebook for Practitioners*. TRB Report 35, Transit Cooperative Research Program, Transportation Research Board (http://www.trb.org), 1998.

This comprehensive guidebook describes various technical methods for measuring the economic impacts of transit investments, including changes in adjacent property values. It also includes a summary of research findings on the increases in property values found around BART stations in the San Francisco Bay area. See Appendix for a summary of property value impacts. Tables 9.6 to 9.10 list 15 studies dating from 1970 to 1996 that calculate the premium effect of transit investments, measured in unit area of property.

35) Cervero, Robert. "Rail Transit and Joint Development: Land Market Impacts in Washington, D.C. and Atlanta." *Journal of the American Planning Association* 60(1) (1994): 83–94.

In addition to public-private cost sharing and the lease revenues derived from commercial space in rail stations, joint development projects generate more fare revenues as they stimulate more transit trips. This study examines how transit investments affect office market indicators. Evidence shows that joint development projects create measurable land-value increases and other associated benefits. Among five dependent variables studied, office rent levels are most closely correlated with transit factors, especially ridership. Other benefits associated with transit centers are low vacancy rates, higher absorption rates, and larger office building size. In conclusion, urban rail transit will significantly benefit land use and site rents only if a

region's economy is growing and supportive programs such as permissive zoning are in place.

36) Cervero, Robert. "Transit-Based Housing in the San Francisco Bay Area: Market Profiles and Rent Premiums." *Transportation Quarterly* 50(3) (1996): 33–49.

This study focuses on apartment rents rather than housing prices. In the proximity of three BART stations selected, most residents occupied multi-unit complexes of 20–60 units and formed single-car households comprised of young adult singles or couples without children, with above-average incomes. Within two of the station areas, housing rents were found to be 10–15 percent higher than the average rents in nonstation areas. In the third (Richmond) station area, no rent premium was found. In his guarded conclusion, Cervero states that "in theory, the existence of a rent premium for multi-unit projects suggests value capture mechanisms (e.g., forming benefit assessment districts) could be used to help finance rail systems," adding without explanation: "although this is very difficult to implement in practice." It is not clear what prompted this caveat—the implied difficulty of political acceptance, or perhaps legal constraints to the formation of taxing districts or bond-financing mechanisms.

37) Cervero, Robert, and Michael Duncan. "Benefits of Proximity to Rail on Housing Markets: Experiences in Santa Clara County." *Journal of Public Transportation* 5(1) (2002): 1–18.

Hedonic price models show that nearness to light rail and commuter rail stops substantially add value to residential parcels. Large apartments within a quarter-mile of LRT stations command land-value premiums as high as 45 percent. Such market profits provide a potential source of local revenue from value-capture programs.

38) Cervero, Robert, and Michael Duncan. "Transit's Value Added: Effects of Light Commercial Rail Services on Commercial Land Values." Presented at TRB Annual Meeting, 2002 (available at http://www.apta.com/info/briefings/cervero_duncan.pdf).

This study models the value effects of proximity to light rail and commuter rail stations, as well as freeway intersections, in Santa Clara County, California. Substantial capitalization benefits to commercial

retail and office properties were found, on the order of 23 percent for a typical commercial parcel near an LRT stop, and more than 120 percent for commercial land in a business district within a quarter-mile of a commuter rail station.

39) Cervero, Robert, Christopher Ferrell, and Steven Murphy. "Transit-Oriented Development and Joint Development in the United States: A Literature Review." *Research Results Digest* 52, Transit Cooperative Research Program (October 2002).

This is a comprehensive review of literature on transit-oriented development (TOD). Topics include: definition of TOD, agency roles, impacts and benefits on land markets, supportive policies and regulations, the use of value-capture financing, and station area design supportive of TOD. The authors suggest that transit boards might share in the land-value benefits derived from proximity to transit by participating in joint development as well as value capture.

40) Chen, Hong, Anthony Rufolo, and Kenneth Dueker. "Measuring the Impact of Light Rail Systems on Single Family Home Values: An Hedonic Approach with GIS Application." *Transportation Research Record 1617*, TRB, National Research Council, Washington, DC (1998).

Proximity to transit stations accounts for a 10.5 percent home price differential. This confirms the findings of Al-Mosaind et al. (see Reference 26). They conclude that the positive effects outweigh the negatives.

41) Damm, David, Steven Lerman, Eva Lerner-Lam, and Jeffrey Young. "Response of Urban Real Estate Values in Anticipation of the Washington Metro." *Journal of Transport Economics and Policy* (September 1980): 315–335.

The authors draw conclusions from reviews of earlier studies of value-capture financing, showing that in response to new transit lines, land values are enhanced in centers of concentrated activity and in predominantly undeveloped areas. Their Metro case study demonstrates that the values of retail properties are highly sensitive to proximity to transit stations. This suggests that retail areas are better suited for value-capture policies.

42) Diaz, Roderick B. "Impacts of Rail Transit on Property Values." Commuter Rail/Rapid Transit Conference, Toronto, Ontario, American Public Transit Association, 1999.

The author summarizes recent North American studies examining the impact of 12 rail projects, including both heavy rail and light rail. Several variables contributing to positive and negative changes in property values are identified. In Miami, home values near stations increased by up to 5 percent (Gatzlaff 1993). In Toronto, nearby home value increases averaged $2,237 (Bajic 1983). In general, proximity to rail increases accessibility, which is the primary factor in rising property values. http://www.apta.com/info/online/diaz.pdf (from "Rail Transit and Property Values" in *Information Center Briefing* 1(March 2001), at http://www.apta.com/info/briefings/briefings_index.htm).

43) Dunphy, Robert T. *The Cost of Being Close*. ULI Working Paper 660, Urban Land Institute, October 1998.

In southern California, real estate consultant Larry Netherton compared examples of comparable housing for sale at different distances from a central business area. Buyers would have to travel another 15 to 30 minutes to trim $10 to $15 per square foot off the price of a house. In Orange County, two similar upper-end housing projects were compared, one near major employment, retail, and cultural centers, and the other 20 miles away from employment centers. The closer units sold for an average of $599,400, and the distant units sold for $320,000—a difference of about $280,000, or $14,000 per mile, or $11,200 per minute of extra commute time. In more distant Riverside County, the closer project was priced at $214,900, while a same-sized, similar house 20 miles farther out sold for $141,900. The differential here was $73,000 total, or $3,600 per mile, or $2,400 per minute of extra commute time.

44) Fejarang, R. A. "Impact on Property Values: A Study of the Los Angeles Metro Rail." Transportation Research Board 73rd Annual Meeting, January 1994.

In a city such as Los Angeles, value impacts can be caused by regional as well as local behavior. Did the announcement of Metro Rail impact property values? The announcement involved a consortium of federal, state, and local funding propositions that began in 1983 and were legislated in 1988. The period studied was from 1980

to 1990, during which plans became actualized. That is, investments were secured and rail transit was under design and construction, but not yet available for riders or for rider-dependent shopping. Isolating exogenous variables was accomplished at both macro and micro levels. Using a pretest-posttest control group, property values following the period of actualization were found to be significantly different from prior values. Property values near rail lines were found to be significantly different from property values located a distance (from Transport Research Laboratory).

45) Garrett, Thomas. *Light Rail Transit in America: Policy Issues and Prospects for Economic Development.* Federal Reserve Bank of St. Louis (http://www.stlouisfed.org), 2004.

A hedonic pricing model applied to residential property values in St. Louis found that average home values increased $140 for every 10 feet closer proximity to a MetroLink rail transit station, within a radius of 1,460 feet. A home situated 100 feet from a station had a price premium of $19,029, representing a 32 percent increase in average property value. Garrett's study also noted an increase in values beyond the maximum radius, but noted that other factors not related to station proximity and not included in the model, such as traffic volumes on nearby streets, are probably responsible for this effect. His analysis did not investigate transit impacts on commercial property values, which he surmises would also experience positive effects.

46) Gatzlaff, Dean H., and Mark Smith. "The Impact of the Miami Metrorail on the Value of Residences Near Station Locations." *Land Economics* 69(1) (1993).

Miami Metrorail began operations in the mid-1980s in a recently burgeoning city with a sprawling land-use pattern. The 20 miles of rail line traverse the city center, extending to the more affluent north and the poorer south. Both of the extensions were planned in the path of existing built-up neighborhoods where it was hoped that redevelopment would occur. For a study methodology, the researchers chose to examine home resales, those having sold more than once over the past 18 years. They looked for price changes after the announcement of the new line. The anticipated presence of transit service did perceptibly lift nearby site values, but only in the

south-side neighborhoods, where recent capital investments had been activating the redevelopment market. Compare this study with the downtown Miami study of retail sales increases (Reference 59). The larger study of Miami's rail system is also cited in References 21 and 42.

47) Goodwin, Ronald E., and Carol A. Lewis. *Land Value Assessment Near Bus Transit Facilities: A Case Study of Selected Transit Centers in Houston, Texas.* Southwest Region University Transportation Center, Houston, TX, 1997.

Site values in the Houston region were falling due to shrinking incomes and diminished incomes. However, values fell less near bus stops than they did in more distant locations.

48) Gruen, Aaron. *The Effect of CTA and Metra Stations on Residential Property Values: Transit Stations Influence Residential Property Values*. Report to the Regional Transportation Authority, June 1997.

By improving accessibility, lessening congestion, and reducing household transportation costs, transit service adds value to residential locations. Observing 96 Chicago-area Chicago Transit Authority (CTA) and Metra stations, Gruen used hedonic modeling supplemented by a literature review and interviews with realtors and other experts on local market conditions. More important than the presence of a transit station is the perception of neighborhood desirability. Still, the proximity of transit does positively affect property values. The price of a single-family house located 1,000 feet from a station is 20 percent higher than a comparable house located a mile away. Realtors in both the affluent suburban West Hinsdale station area and the gentrifying Logan Square area on Chicago's northwest side point out that prices have been increasing and that these locations increasingly appeal to younger, higher-income professionals, many of whom commute via CTA or Metra to downtown Chicago. Apartment properties located closer to train stations tend to realize higher rents and occupancy levels than comparable apartments less conveniently located (http://www.ggassoc.com/ from "Rail Transit And Property Values." *Information Center Briefing* 1 (March 2001), at http://www.apta.com/info/briefings/briefingsindex.htm).

49) Huang, W. *The Effects of Transportation Infrastructure on Nearby Property Values: A Review of the Literature*.

Working Paper 620, Institute of Urban and Regional Development, Berkeley, CA, 1994.

The effect of the presence of transportation infrastructure on distant lot values is small, but there are many distant lots; therefore, the hedonic method may underestimate incremental site rents. Furthermore, it may be a mistake to regard as exogenous the values attributed to other amenities that developers add in response to accessibility-induced value.

50) Kay, J. H., and G. Haikalis. "All Aboard." *Planning* 66(October 2000): 14–19.

In Dallas, DART has shown what a modern city driven by the private sector can accomplish with rail transit. Property values around transit stations have jumped by approximately 25 percent since DART began operation in 1996. However, Dallas's extensive land area complicates transit's contribution to the regional transportation system. In a sidebar, Haikalis describes New Jersey's new Hudson-Bergen Line. (Available from: APA, 122 South Michigan Avenue, Suite 1600, Chicago, IL 60603-6107, TRIS Database: "Taxing Property Values for Transit.")

51) Knaap, Gerrit, Lewis Hopkins, and Arun Pant. *Does Transportation Planning Matter? Explorations into the Effects of Planned Transportation Infrastructure on Real Estate Sales, Land Values, Building Permits, and Development Sequence*. Research Paper, Lincoln Institute of Land Policy, 1996.

This study observed property values in the Westside LRT corridor in Washington County, suburban Portland, Oregon. The study compared values prior to construction with values at the beginning of LRT operations. Values of parcels located within one-half mile of the line were found to decrease with distance from the stations but rise with distance from the rail line between stations. Thus, the opposite affects of accessibility and nuisance were deduced.

52) Landis, John, Robert Cervero, Subhrajit Guhathukurta, David Loutzenheiser, and Ming Zhang, Rail Transit Investments. *Real Estate Values, and Land Use Change: A Comparative Analysis of Five California Rail Transit Systems*. Monograph 48, Institute of Urban and Regional Studies, University of California at Berkeley, July 1995.

This study measured ground distance to BART stations in Alameda and Contra Costa Counties, California. The authors found that 1990 single-family home prices declined by $1 to $2 per meter distance from a BART station. They did not find a significant impact on home values based on proximity to CalTrain commuter rail stations, although houses within 300 meters of the CalTrain right-of-way sold at a $51,000 discount. No increase in value around commercial/industrial stops was found, but the authors note that commercial property observations encounter significant data measurement problems.

53) Lewis-Workman, Steven, and Daniel Brod. "Measuring the Neighborhood Benefits of Rail Transit Accessibility." *Transportation Research Record* 1576 (1997): 147–153 (Transportation Research Board, http://www.trb.org).

The authors found that within a one-mile radius from the Pleasant Hill Rail Station in the Bay Area, average home prices decline by about $1,578 for every 100 feet distance from the station. In the area within a one-mile radius from the Forest Hills, 67th Avenue, and Rego Park rail stations, average home prices decline by about $2,300 for every 100 feet distance from the station.

54) Nelson, Arthur C. "Effects of Elevated Heavy-Rail Transit Stations on House Prices with Respect to Neighborhood Income." *Transportation Research Record* 1359 (1992): 127–132.

Nelson studied the impact of elevated rail stations on single-family homes in Atlanta. Within its low-value neighborhoods, Nelson found that a transit stop raises residential values. Curiously, high-value communities installing a transit stop appears to lower site values—by nearly the same amount. Both the affluent northern and the poorer southern sectors contribute equally to ridership, although the south's contribution includes a higher percentage of the workforce. Owner occupancy rates were almost equal in both north and south. The observed impact on property prices: in the south sector, the farther from a station, the lower the home's value; in the north, the reverse was found. Total negative effects in the north were $9 million; total positive effects in the south were $10 million.

55) Nelson, Arthur C. "Transit Stations and Commercial Property Values: A Case Study with Policy and Land-Use

Implications." *Journal of Public Transportation* 2(3) (1999): 77–95.

Nelson develops a theory of commercial property value with respect to both transit station proximity and the role of policies that encourage commercial development around transit stations without discouraging such development elsewhere. He applies this theory to sale of commercial property in Atlanta's "Midtown," located 1 kilometer (.6 mile) north of the downtown edge. Midtown is served by three heavy rail transit stations operated by the Metropolitan Atlanta Transit Authority (MARTA). To encourage transit-oriented development near MARTA stations, the city waives parking requirements and floor area ratio restrictions. Commercial property values are affected positively by both access to rail stations and by policies that encourage more intensive development around those stations. Using ground distance to a MARTA station as a measure of access, a citywide analysis finds that price per square meter falls by $75 for each meter of linear separation. Average prices rise by $443 for a location within special public interest districts.

56) Parsons Brinkerhoff. "The Effects of Rail Transit on Property Values: A Summary of Studies." Research carried out for Project 21439S, Task 7. NEORail II, Cleveland, OH, February 27, 2001.

This paper summarizes the results of several previous studies in tabular form. The authors note that varying methodologies make it difficult to compare results. Nevertheless, it is clear that in most cases access to transit systems is valued by property owners. Rail's influence on residential values is demonstrated more clearly than on commercial uses; however, influence on commercial values appears to vary by: (1) how much accessibility is improved, (2) the relative attractiveness of locations near stations, and (3) the strength of the regional real estate market.

57) Pickett, M. W., and K. E. Perrett. *The Effect of the Tyne and Wear Metro on Residential Property Values.* Supplementary Report 825, Transport and Road Research Laboratory, Crowthorne, Berkshire, UK, 1984.

Three different methods of analysis are performed on the data collected. Results show an average increase of £360 (1.7 percent) in the

value of properties near Metro stations during the four-month period surrounding the date on which each section of line opened. In reference to related studies, Dvett et al. found a small but significant positive effect on the value of single-family dwellings at three of the six BART station areas studied. Lerman et al. found that distance from Washington Metro stations influences property values, the value rising as the opening date nears and falling if the opening is delayed. The Regional Commission in Atlanta found an associated increase in industrial property values.

58) Price Waterhouse Coopers. "Review of Property Value Impacts at Rapid Transit Stations and Lines." Technical Memorandum 6, Richmond/Airport—Vancouver Rapid Transit Project, April 3, 2001.

The authors review transit impact studies from selected cities across North America. The reviewers find a positive relationship between property values and station location, but also a possible negative impact on single-family homes along the line due to nuisance impacts. Four research reports are summarized: (1) "Transit Case Studies for the City of Hillsboro, Oregon," (2) "Transit Benefits 2000 Working Papers," (3) "Light Rail Transit Impacts in Portland, Oregon," and (4) "Impact of the Vancouver, BC Skytrain on Surrounding Real Estate Value."

59) Richert, Thomas M. *Economic Impacts of Automated People Mover Development in Commercial Centers*. Advanced Transit Association, 1999.

After one year of operation of the APM, retail sales in downtown versus the greater metro region grew in Denver by 8 percent, in St. Louis by 4 percent, and in Miami by 1 percent (where patronage of downtown commercial space had been lagging historically). Higher retail sales translate into higher site values.

60) Rice Center for Urban Mobility Research. *Assessment of Changes in Property Values in Transit Areas.* Urban Mass Transit Administration, Houston, TX, 1987.

This is a summary of earlier findings from Toronto, Baltimore, Denver, San Diego, and San Francisco. Some transit centers showed a 100 percent to 300 percent increase in commercial site values. In Atlanta, 61 percent of the businesses within 500 feet of a transit stop reported increased sales.

61) Ryan, S. "Property Values and Transportation Facilities: Finding the Transportation-Land Use Connection." ***Journal of Planning Literature*** **13(4) (1999): 412–427.**

Ryan reviews empirical studies of the relationship between the presence of transportation facilities—highways, heavy rail, and light rail transit systems—and property values. Inconsistencies in findings from this literature over the past several decades are explained. For example, results vary based on whether researchers measure accessibility in terms of travel time or travel distance. Measuring distance yields mixed results in property value effects. Measuring time yields the expected inverse relationship between access to transportation facilities and property values. The delineation of study areas also influences the direction of effects. This study offers a new interpretation of the transportation facility-property value literature, improving the ability to measure relationships and to anticipate land-market responses to transportation facilities.

62) Sedway Group. "Regional Impact Study." Commissioned by Bay Area Rapid Transit District (BART), July 1999. In Transit Resource Guide, ***Rail Transit and Property Values,*** **American Public Transportation Association, 1666 K Street NW, Washington, DC.**

This is a review of studies of the benefits associated with BART service, measured in residential and office property impacts. Reported single-family home values fell by $3,200 to $3,700 for each mile distance from a BART station in Alameda and Contra Costa Counties. Apartments near BART stations were found to rent for 15 percent to 26 percent more than apartments more distant from BART stations. The average unit land price for office properties also decreased as distance from a BART station increased, from $74 per square foot within a quarter-mile of a station to $30 per square foot at locations exceeding half a mile.

63) Voith, Richard. ***Transportation, Sorting, and House Values in the Philadelphia Metropolitan Area.*** **Working Paper No. 90-22, Federal Reserve Bank of Philadelphia, Economic Research Department, 1990.**

Households prefer residential locations close to their jobs. Employees who work in central business districts choose census tracts served by commuter rail and tend to own fewer cars. Holding all other factors

constant, the value of commuter rail service is capitalized into house value, adding an extra $5,716 or 6.4 percent. In the aggregate, the accessibility premium in real estate values for the Philadelphia suburban area is in the order of $2.43 billion. At a discount rate of 10 percent, residents with rail service should be willing to pay $243 million a year to keep the system, whether or not they use it. Despite the increasing decentralization of the region, over half of the residents of the metropolitan area have a direct interest in the quality of public transportation and economic health of the CBD, regardless of workplace.

64) Weinberger, Rachel R. *Commercial Rents and Transportation Improvements: Case of Santa Clara County's Light Rail.* WP00RW2, Lincoln Institute of Land Policy, 2001.

In Santa Clara County, California, property owners sued the county, claiming losses in value from the nearby light rail. To determine the actual effect of the light rail facility on property values, Weinberger examined commercial property rents, comparing accessibility to transit and to highway as determinants of rent, and analyzed the effects over time. Controlling for other factors, properties within a half-mile of light rail stations were found to command almost 15 percent more rent. Highway access, being ubiquitous, offers no particular locational advantage. As the transit system matured, nearby properties accrued greater benefits. But, in times of high demand, so did all other locations command higher rents.

65) Weinstein, Bernard L., and Terry L. Clower. *The Initial Economic Impacts of the DART LRT System*. Center for Economic Development and Research, University of North Texas, July 1999.

Values of properties adjoining Dallas's DART light rail stations grew 25 percent more than similar properties not served by the rail system. Proximity to stations appears to be an economic advantage for most classes of real estate, especially Class A and C office buildings, and commercial strip retail outlets. Average occupancy rates for Class A buildings near rail stations increased from 80 percent in 1994 to 88.5 percent in 1998, while rents increased from an average $15.60/sf to $23/sf. Commercial strip retailers near the stations experienced a 49.5 percent gain in occupancy and a 64.8 percent improvement in rental

rates (http://www.dart.org/economic.htm; from "Rail Transit and Property Values" in *Information Center Briefing* 1 (March 2001), at http://www.apta.com/info/briefings/briefings_index.htm).

IV

Lessons from Developing Countries

66) Calvo, Christina M. *Options for Managing and Financing Rural Transport Infrastructure*. Technical Paper No. 411, World Bank, Washington, DC, 1998.

Berkshire, England, successfully privatized the maintenance of roads. Calvo suggests applying this model to developing countries, where central governments are often hierarchical and indifferent to rural areas. "If increases in land value are captured mainly by the local elite or by outsiders, however, there will be little motivation for mass participation in the project."

67) Cervero, Robert, and Bambrang Susantono. "Rent Capitalization and Transportation Infrastructure Development in Jakarta." *Review of Urban and Regional Development Studies* 11(1), Department of City and Regional Planning, University of California, Berkeley, CA, 1999.

Freeway off-ramps raised the rents of nearby offices in Jakarta, Indonesia. Thus, value capture would be fair, but the method is not feasible because land ownership and values are not registered; furthermore, owners can buy off tax collectors.

68) Dalvi, M. Q. "Value Capturing as a Method of Financing Rail Projects: Theory and Practice." From the 7th CADATU Conference: Urban Transport in Developing Countries, New Delhi, India, 1996.

Hong Kong's Mass Transit Railway Corp. chooses to not sell land but co-develop it. Property rental income financed about 22 percent of MTRC's operating cost in 1993.

69) Heggie, Ian G. "Financing Public Transport Infrastructure: An Agenda for Reform." Proceedings of Seminar M, PTRC Summer Annual Meeting, P327, Planning and Transport Research and Computation (International) Co., 1989.

In the developing world, value generated by a transport system can

be significant. However, often cadastre records are missing or lack information on registered owners and the value of parcels. Furthermore, better-off owners "are often influential local politicians."

70) Leinbach, L. R. "Transport and Third World Development: Review, Issues, and Prescription." *Transportation Research. Part A, Policy and Practice* 29(5) (1995): 337–344.

This study notes several studies that provide solid empirical evidence of the positive benefits of rural roads. Nevertheless, land tenancy is often a major determinant of who benefits; if land is unevenly distributed, the land-poor will receive little benefit. In urban areas, the amount and location of transportation infrastructure affects labor accessibility, which in turn affects the manufacturing sector and economic productivity. The author emphasizes the importance of fairly allocating capital investments to provide maximum benefit to the greatest number of people. The problem is that typical market demand models lead to an undifferentiated view of benefits and costs to households. Author's suggestion: A general citizens' dividend derived from the excess revenues of a high land-value tax on property owners might provide a solution to the maldistribution of wealth, or effective demand.

71) Lewis, David, and Fred L. Williams. *Policy and Planning as Public Choice: Mass Transit in the United State* (Hampshire, U.K.: Ashgate, 1999).

In this book's preface, the authors state: "The public realizes $5 in cash savings for each tax dollar invested in transit services." This general benefit is achieved by the external cost-cutting effects of reduced private car usage, reduced traffic congestion, and the relatively low cost of transit riding by consumers. On page 141 is a chart clearly showing the correlation between transportation mobility and national wealth. The implication is that policymakers having the aim of lifting people out of poverty must take seriously the goal of affordable mobility, which transit offers.

72) Meakin, R. T. "Hong Kong's Mass Transit Railway: Vital and Viable." In *Rail Mass Transit for Developing Countries. Proceedings of the Conference Held in London on 9–10 October, 1989* (London: Telford, 1990). pp. 125–143.

Meakin notes that in Hong Kong the transit system receives no subsidy. All of its costs, including interest, are derived from rents from land development. "Discussion" by J. Faukner notes that the World Bank requires mass transit (but not roads) to be self-financing, and that lenders should minimize environmental impacts.

73) Ortiz, Alexandra. "Economic Analysis of a Land Value Capture System Used to Finance Road Infrastructure: The Case of Bogota, Colombia" Ph.D. diss., University of Illinois at Champaign-Urbana, 1996.

Starting in 1926, the city of Bogota has charged property owners the anticipated rise in site value ("valorization") before road construction has begun. Revenue from these charges declined in the late 1980s as assessments fell behind and as poor landholders could not afford even the lagging assessments. A 1992 valorization had collected 80 percent of its target by mid-1995. Presumably, the city made up the difference with other taxes, since new roads did get built. What worked for roads could work for transit as well. Ortiz concludes that pre-emptive betterment charges for infrastructure would not be needed if a general land tax were working well. Colombia has a municipal land tax rate of 1 percent and a national rate of 2 percent, plus a land gains tax of up to 50 percent, yet land is registered at only 20 percent of its value.

74) Prest, A. P. *Transport Economics in Developing Countries* (Praeger, 1969).

Prest relates how Uruguay has historically funded roads from land rent. In 1928, the country set up its Permanent Fund for Development and Farm-to-Market Roads, financed by taxes on gasoline, tires, and land value—prorated by distance from the road. Even at a very low rate, 0.125 percent to 0.65 percent, the land-value tax funded one-third of the road construction budget. However, assessments did not keep pace with rising land values, and confusion arose when proximity to more than one road entered into the reckoning. Hence, the LVT fell into disuse.

75) Tsukada, Shunso, and Chiaki Kuranami. "Value Capture with Integrated Urban Rail and Land Development: The Japanese Experience and Its Applicability to Developing Countries." Proceedings of Seminar M, PTRC Transport and Planning

Annual Meeting, University of Sussex, England, PTRC Education and Research Services, September 1990.

To win matching funds from the Japanese central government for planned urban rail systems, local governments must raise 35 percent of the construction costs. Some jurisdictions increase the property tax rate to raise the required revenue. Taxable value is determined by distance from the rail station and the city center. Another strategy is to develop fallow land along the rail corridor. One private rail line earns 18 percent of its total revenue from real estate (plus 54 percent from the railway and 28 percent from other businesses). The authors recommend that public transit agencies serve extant demand from riders, coincide construction with an economic upswing, cooperate with the private sector, commit themselves then deliver on their promises, and become competitive with other transport modes.

76) Walmsley, D., and G. Gardner. *The Economic Effects of Public Transport*. Transport Research Laboratory in TRIS Database: "Taxing Property Values for Transit," 1993.

Studies from Western Europe, North America, and various developing countries show how changes in the organization and financing of public transport affect patronage and urban development. Its general findings could apply, perhaps on a smaller scale, to other improvements in public transport such as busways. It considers funding from: (1) revenues, (2) taxation, (3) land-value capture, (4) advantages and disadvantages of assured funding, and (5) the involvement of private capital. Besides improving public conveyance, rapid transit systems can also improve the environment and the "image" of a city, as well as encourage new urban development and enhance safety. Bus transit deregulation in the United Kingdom illustrates how market disciplines can be applied to bus operation, and how privatization might affect public transport. The report offers recommendations for transport planners in Eastern European countries.

V

Additional Titles, Not Annotated

Day, Philip. *Land Value Capture*. Report to the Local Government Association of Queensland, February 1992.

Freeman, Mark J., and F. G. Price. "Value Capture: A Neglected Factor in the Funding of Transport Facilities." Reprint of paper prepared for the Annual Transportation Convention, C. 106, Paper 5D-10, Roads and Transport Technology, No. 687. Pretoria, South African Council for Scientific and Industrial Research, Division for Roads and Transport Technology, August 1989.

Hilling, David. *Transport and Developing Countries* (London: Routledge, 1996).

Hsu, Kuo-Wei. *The Impact of Mass Rapid Transit Systems on Land Values: Case Study, Taipei,* Chaoyang University, Taiwan, 1996 (available from: secret@mail.cyut.edu.tw).

Lawrence, Wai-chung Lai. "The Effect of MRT [Mass Rapid Transit] on Land Values Rekindled." *Journal of Property Valuation & Investment* 9(2) (1991). MCB University Press Limited.

Marwick, Peat. *Fiscal Impact of Metrorail on the Commonwealth of Virginia*. KMPG, Inc., November 1994.

Scheurer, Jan, Peter Newman, Jeff Kenworthy, and Thomas Gallagher. *Can Rail Pay? Light Rail Transit and Urban Redevelopment with Value Capture Funding and Joint Development Mechanisms*. Institute for Science and Technology Policy, Australia, 2000.

Tisato, P. "A Comparison of Optimization Formulations in Public Transport Subsidy." *Rivista Internazionale di Economia dei Trasporti* 27 (June 2000).

United Nations Centre for Human Settlements. *Comparative Modal Efficiencies in Urban Transport, With Reference to Developing Countries, Volume I*. Report No. HS/236/91E, Mass Public-Transport Modes and Sustainable Development, 1991.

VNI Rainbow Appraisal Service. *Analysis of the Impact of Light Rail Transit on Real Estate Values*. San Diego: Metropolitan Transit Development Board, 1992.

Voith, Richard. "Changing Capitalization of CBD-Oriented Transportation Systems: Evidence from Philadelphia, 1970–1988." *Journal of Urban Economics* 33 (1993): 361–376.

ZHA, Inc. *Amherst Corridor Alternative Analysis: Economic Development/Value Capture Study: Task IV, Analysis of Land Use and Development Activity*. For Niagara Frontier Transportation Authority, December 1988.

VI

New Directions in Transit Research

AS THIS BIBLIOGRAPHY SHOWS, a large part of the literature on the subject of transit financing is aimed at empirical evidence of the incidence of rising land values associated with distance from transit stops following the installation of rail transit improvements. Most of the research related to value capture conducted since 1980 alludes to but does not answer the question of whether special land assessments within transit station benefit areas might be a feasible method of financing transit systems. The importance of value capture is mounting due to urban planners' current interest in transportation-oriented development (TOD) in station areas. Here, the symbiotic relationship between improved transit ridership and the land-use efficiencies that derive from concentrated, mixed-use development offers an even better prospect for enhancing land-value increments to be captured. A land-based property tax is also thought to be an effective way to encourage private development around a public transit project.

The jury is in. After 25 years of empirical research, it appears the positive effects of transit access are confirmed. It is now time for transit/land-use research to move from hypothesis testing and toward the practical applications of value capture. We propose two means to accomplish this. The first is a shift in the research paradigm; the second is the dissemination of information to local public agencies.

1. It would be helpful to shift research methods from the use of static models to dynamic models, showing the effects of transit station access on property values over a period of time during which land-value increments accumulate. A perusal of the citations in this bibliography will show that the typical measure of effects is the percentage difference between the property price in nearby versus distant locations with respect to rail stations. But in actual fact, would not the differential vary over time? The research question could be reframed: How does the *growth* of property values in the vicinity of station areas compare with *growth* in areas within the same jurisdiction not served by rail

stations? The longitudinal dimension is useful because the research findings have direct relevance to the application of value-capture mechanisms that rely on a cost-recovery period.

Dynamic models can help predict land-value increments over a period of years, yielding estimates of the total capturable revenues that would support the debt financing of capital improvement projects. Rather than the expression of percentage differential in values, an appropriate measure might be comparative average annual growth rates. For example, the observed differential in property values following the construction of transit improvements may actually reveal a comparative growth rate of 8 percent in the wider service area versus a 12 percent growth rate within station areas (which could be circumscribed as potential transit benefit districts, or special assessment districts).

When projecting rates forward from the point of announcing a new transit line, the percentage differential is expected to increase, due to superior locational advantage, upzoning (allowable density increases), and mounting development activity. However, over a long time period, the annual growth rate differential may decrease and finally level off, causing land values to increase at a decreasing rate. Model refinements could include expected variations in growth rates over time, accounting for stages in the land-appreciation cycle: predevelopment, construction/full operation, to the mature market phase (RICS 2002). Basing their projections on such research findings in various regional transportation markets, transit planners would have the necessary data to put together capital financing with such mechanisms as increment bond financing for special assessment districts. This leads to the second means of moving research in a new direction.

2. Even after years of research and legislative initiatives, the manuals and primers produced by transit organizations rarely contain specific reference to value-capture financing. For example, *Financing for Capital Investment: A Primer for the Transit Practitioner* (Transportation Research Board 2003) outlines several conventional financing mechanisms and capital

sources. These consist of various types of bonds, partnerships, and taxes (including tax increment financing and special assessment districts and lease transactions), but none of these mechanisms is linked to land-value increments as a revenue source. If the main body of research were to shift its emphasis to real-world applications of value capture, government-sponsored reports, manuals, and policy guides could be expected to devote greater attention to value-capture mechanisms.

The authors acknowledge the commendable work conducted by the RICS Policy Unit. The Royal Institution of Chartered Surveyors and the Office of the Deputy Prime Minister commissioned a study identifying the relationship between land use, land value, and public transport. Stage 1 of the study (review of literature) was undertaken by Jeremy Edge and Jamie Fox at ATIS REAL Weatheralls, by David Banister, Claudio de Magalhaes, and Stephen Marshall at University College London, and by Andrew Marsay at Symonds Group. Listing about 150 references, this review finds common elements and summarizes the evidence in tables. It is interesting that the authors note the scarcity of time-series analysis, and state that ideally data should be available from before the decision to build transit improvements is taken, and immediately after opening, as well as downstream. This is our principal finding as well.

References

RICS Policy Unit. (2002). *Land Value and Public Transport, Stage 1: Summary of Findings*. RICS Contact Centre, Coventry, UK.

Transportation Research Board, Transportation-Technology Management. (2003). *TCRP Report 89*. Transit Cooperative Research Program.